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XXXIV. *An Account of the Lymphatic System in Birds; by Mr. William Hewson, Reader in Anatomy: In a Letter to William Hunter, M. D. F. R. S. and by him communicated to the Society.*

S I R,

Read December 8,
1768.

HAVING been so fortunate, in a series of experiments made with that view, as to trace out the lymphatic system in birds, I have ventured to offer the following account of it to you, in order to be presented, if you think proper, to the Royal Society; and, I flatter myself, this discovery will be looked upon as some acquisition to physiology.

The lymphatic system has been supposed to be wanting in birds; and absorption in that kind of animals to be carried on by branches of the common veins. Physiologists were led into this opinion by observing, that though the lacteals and mesenteric glands were easily seen even in the smallest quadruped, yet the most acute anatomists had not been able to find in any bird the least appearance either of those vessels or glands. The difficulty of discovering the lacteals in birds was, no doubt, principally owing to the transparency, or want of colour, in the fluid which they contain. In quadrupeds the lacteals are easily found, as they are filled with chyle, which is mostly opaque and white; whereas, in birds, the chyle is as pellucid and colourless as the vessels themselves.

The want of mesenteric glands was another cause of our remaining so long ignorant of those vessels.

This system may be divided in birds, as it is in quadrupeds, into the branches, viz. the lacteals and lymphatics, and their trunk, or thoracic duct. The lacteals indeed, in the strictest sense, are, in birds, the lymphatics of the intestines, and like the other lymphatics carry a transparent lymph. And instead of one thoracic duct there are two, of which one goes to each jugular vein. In these circumstances it would seem, that birds differ from quadrupeds, so far at least as I may judge from the dissection of a goose, which was the bird I chose as most proper for this enquiry.

So much being premised, I shall next give a description of what I have seen of those vessels in this fowl; and to illustrate the description I shall add a figure from the same subject, in which those vessels were filled with quick-silver.

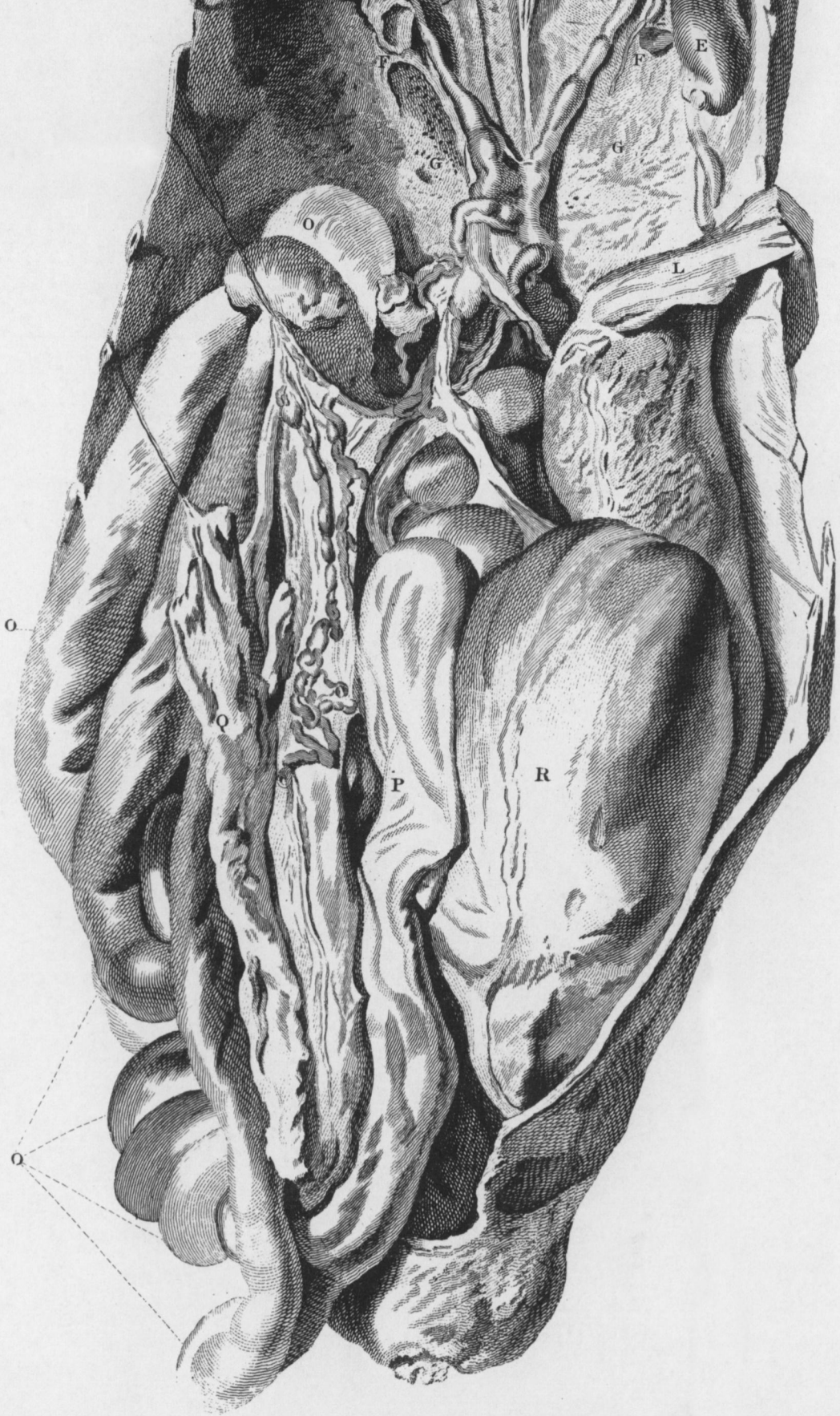
The lacteals run from the intestines upon the mesenteric vessels. Those of the *duodenum* (*a*)* pass by the side of the *pancreas* (*Q*) †, and probably receive its lymphatics: afterwards they get upon the *cœliac* artery, of which the superior mesenteric is a branch. Whilst they are upon this artery they are joined by the lymphatics from the liver (*b*): here they form a plexus, which surrounds the *cœliac* artery (*cc*); at this part they receive a lymphatic from the gizzard (*d*); and a little farther, another from the lower or glandular part of the *œsophagus* (*e*). Having now got to the root of the *cœliac* artery, they are joined by the lymphatics from the renal *capsulæ*; and near the same part, by the

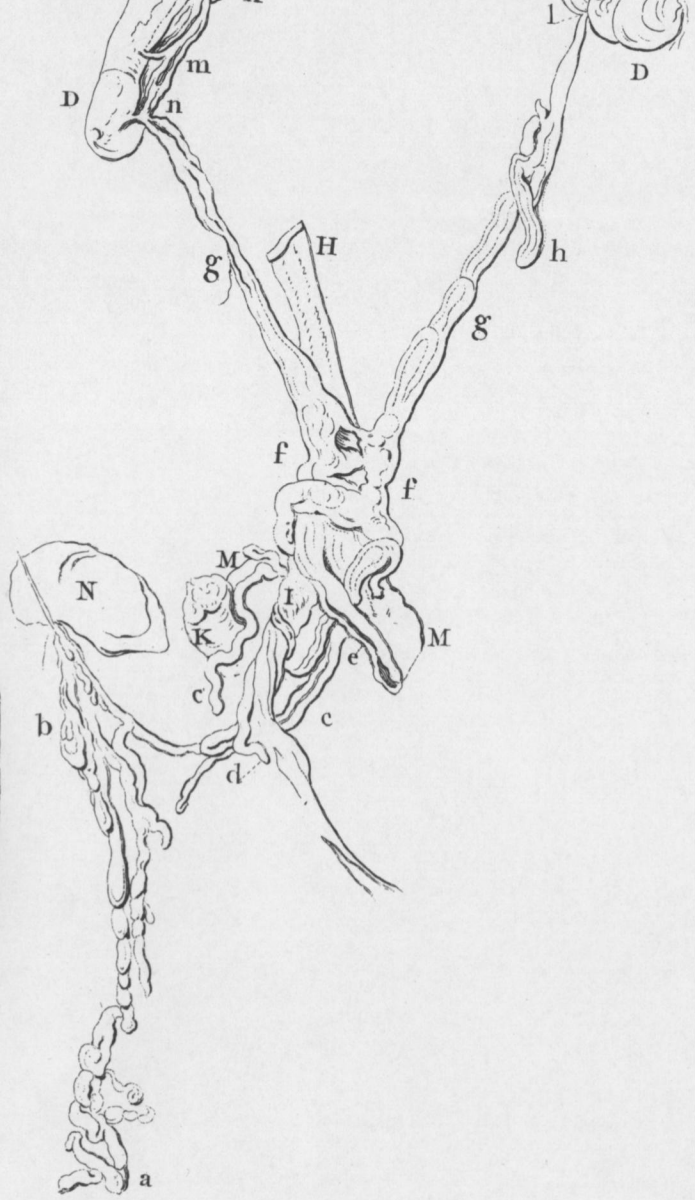
* See Plate X. in the outlines.

† See the same Plate in the Figure itself.









laëteals from the other small intestines, which vessels accompany the lower mesenteric artery. These last mentioned laëteals, before they join those from the *duodenum*, receive from the *rectum* a lymphatic, which runs with the blood-vessels of that gut. Into this lymphatic some small branches from the kidneys seem to enter, which coming from those glands upon the mesentery of the *rectum*, at last open into its lymphatics. At the root of the cœliac artery, the lymphatics of the lower extremities probably join those from the intestines. The former I have not yet traced to their termination, though I have distinctly seen them on the blood-vessels of the thigh; and in one subject, which I injected, some vessels were filled, contrary to the course of the lymph, from the network near the root of the cœliac artery; these vessels ran behind the *cava*, and down upon the *aorta*, near to the origin of the crural arteries, and I presume they were the trunks of those branches which I had seen in the thigh. At the root of the cœliac artery, and upon the contiguous part of the *aorta*, a network (*ff*) is formed by the laëteals and lymphatics above described. This network consists of three or four transverse branches, which make a communication between those which are lateral. In the subject from which my drawing was made, there were four. From this network arise the two thoracic ducts (*gg*); of which one lies on each side of the spine, and runs upon the lungs obliquely upwards towards the jugular vein, into which it opens (*l & n*); not indeed into the angle between the jugular and subclavian, as in the human subject, but into the inside of the jugular vein, nearly opposite to that angle. The thoracic duct of the left side is joined

by a large lymphatic (*b*), which runs upon the *æso-phagus*, and can be traced as far as the lower or glandular part of that canal ; from which part, or from the gizzard, it seems to issue. The thoracic ducts are joined by the lymphatics of the neck (and probably by those of the wings) just where they open into the jugular veins.

The lymphatics of the neck * generally consist of two pretty large branches, on each side of the neck, accompanying the blood-vessels. Those two branches join near the lower part of the neck ; and the trunk is, in general, as small, if not smaller, than either of the branches. This trunk runs close to the jugular vein (*ii*), gets on its inside, and then opens into a lymphatic gland (*kk*). From the opposite side of this gland, a lymphatic comes out, which pours the lymph into the jugular vein. On the left side, the whole of this lymphatic joins the thoracic duct of the same side, (*l*) ; but, on the right, one part of it goes into the inside of the jugular vein a little above the angle (*m*), whilst another joins the thoracic duct, and with that duct forms a common trunk, which opens into the inside of the jugular vein, a little below the angle which that vein makes with the subclavian (*n*).

To this description it may be necessary to add, that though it be taken from one subject, yet in three others of the same species which I examined carefully, I saw nothing which disagreed with it. I particularly attended to the number of the thoracic ducts, suspecting, that possibly in this subject, the two that I had seen might

* It is but doing justice to the ingenious Mr. John Hunter, to mention here, that these lymphatics in the necks of fowls were first discovered by him many years ago.

be only a variety, which is a circumstance that, as we are told, has occurred even in the human body. But in three others of this species, which I likewise successfully injected, I still saw two ducts; and therefore I am inclined to believe, that this is the constant number. I likewise carefully attended to the vessels coming from the gland on the right side: and in the only two subjects in which the lymphatics of the neck were properly filled, I observed, that one part of it opened immediately into the vein, and the other joined the thoracic duct of that side; whilst, on the left side, the vessel which issued from the gland wholly joined the thoracic duct. In all the four subjects I evidently saw that the thoracic ducts open into the inside of the jugular veins.

This system in birds differs most from that in quadrupeds in the following particulars. 1st, In the chyle being transparent and colourless. 2dly, In there being no visible lymphatic glands, neither in the course of the lacteals, nor in that of the lymphatics of the *abdomen*, nor near the thoracic ducts. 3dly, In the several parts of this system in birds being more frequently enlarged, or varicose, than in quadrupeds. In particular, this appears to be the case of the vessels which constitute the network at the root of the cœliac artery in that subject from which the drawing was taken. The lacteals are frequently enlarged in some places; so are the thoracic ducts; and the lymphatics on each side of the neck are commonly, when taken together, larger than their trunk which opens into the lymphatic gland. In one subject, where instead of two lymphatics on the left side I found only one, that vessel was as large as a crow-quill; whilst the
lower

lower part of it, which entered the gland, was much smaller.

Thus far the account of what I saw : I shall next beg leave to observe, that, as the supposed want of this system in birds has been considered as a strong argument in favour of absorption by the common veins, now, since we find it not wanting, that theory must be much weakened. And I may likewise add, that absorption seems to be carried on in birds, as in quadrupeds, by this system, at least principally ; indeed I am inclined to believe, entirely ; for no arguments brought in favour of absorption by the common veins appear to me of equal validity with those that can be urged against it. The contrary opinion is indeed embraced by the most learned and acute physiologist of the present age, who, treating of this subject, expresses himself in the following manner :
 “ It is a strong argument in favour of absorption by
 “ the common veins, that neither birds, amphibious
 “ animals, nor fish with cold blood, have either the
 “ lacteal or the lymphatic system. Nature commonly observes a pretty strict analogy in her works, and
 “ makes use of similar organs to perform similar functions. Now in all animals, quadrupeds and the
 “ whale excepted, we must admit of absorption by
 “ the mesenteric veins, if in those animals there is
 “ no other way for the chyle to get into the blood.
 “ And if those veins in birds and amphibious animals
 “ absorb the chyle, it is very probable they likewise
 “ absorb it in quadrupeds, in which they equally
 “ exist.” But the existence of this system in birds is not the only fact which might be adduced to invalidate the above opinion ; for I have seen a part of it very distinctly in one of the *amphibia*, viz. the
 Turtle

Turtle *. Whether it is to be found in fish, I cannot yet determine. Since I saw it in birds and in the Turtle, I made indeed some enquiries after it in fish, but hitherto without success. Yet, that they are not without such vessels, I think is probable, from considering that the lymphatics are so general, as to be found in quadrupeds, birds, and amphibious animals. And from the consideration of the extensiveness of this system through so many classes of animals, I am inclined to think that opinion most probable, which you advanced some time ago, when you printed your discovery of the use of those vessels, viz. “ That the lymphatics are the “ *only* absorbents †”.

For the sake of those who may incline to prosecute this enquiry farther, I shall now relate the method by which these vessels may be demonstrated; and that is, having chosen a young and very lean goose, and fixed it upon a table, let the abdomen be opened whilst it is yet alive, and a ligature be passed round its mesenteric vessels, as near the root of the mesentery as possible. The lacteals will begin to appear near the ligature in

* The part of this system, which I saw in the Turtle, was the lacteals. I filled them with quick-silver as far as the root of the mesentery, where they formed a considerable net-work into which a lymphatic of the spleen entered. I had not an opportunity of tracing them farther, having taken the mesentery out of the animal before I had thought of looking for these vessels, as I was not at that time intent on this enquiry. The lacteals in that animal agreed with those in the bird above described, in not having any mesenteric glands. From this circumstance, and from another observation which I made, I am inclined to believe, that the whole system in this animal will be found to agree pretty exactly with that of birds.

These vessels I observed so long ago as in the winter 1763-64.

† Vide Hunter's Commentaries, ch. v.

a few minutes after it is made, especially if the bird has been well fed three or four hours before the experiment. The lymphatics in the neck may be shewn in the same manner; that is, by making a ligature on the jugular vein at the lower part of the neck; and to be more certain of including the lymphatics, which are near it, we must take care not to pass the needle too close to that vessel. When they are to be injected, they must be opened at a convenient part, and a proper pipe fixed in them for that purpose.

For the greater satisfaction of those who may think this paper worthy their attention, I have prepared two birds, whose lymphatic systems are filled with quick-silver, in order to be compared with the figure: these have already been shewn to several members of the learned Society, who honoured me with their presence whilst the subjects were fresh; and who, I flatter myself, were then satisfied with the exactness of the drawing.

Mr. Hewson begs leave to add, that since the above paper on the lymphatic system in birds was put into the hands of the secretary of the Royal Society, he has discovered the same system in fish; and has likewise been so fortunate as to procure a Turtle, whose lymphatic system he has traced out, and has got delineated. An account of those dissections, with the figures, he intends soon to have the honour of laying before the Society.

Windmill Street, Dec. 3,
1768.

Expla-

Explanation of P L A T E X.

N. B. *The small Letters refer to the Outlines, and the Capital Letters in general refer to the Figure, except where the contrary is specified.*

- A The Neck.
 - BB The Clavicle divided near its middle.
 - C The left Subclavian Artery.
 - DD The Jugular Veins.—See the Outlines.
 - EE The Pulmonary Arteries.
 - FF The two Branches of the Trachea.
 - GG The Lungs.
 - H The Aorta—in the Outlines.
 - I The Cœliac Artery—in the same.
 - L The Oesophagus turned to a side.
 - MM The Renal *Capsulæ*, or *Glandulæ Renales* — in the Outlines.
 - N A small part of the Liver, fixed to a Rib by a thread.—In the Outlines.
 - OOO Intestines.
 - P The *Duodenum*.
 - Q The *Pancreas* fixed to a Rib by a thread.
 - R The Gizzard.

 - a The Lacteals which come from the *Duodenum*.
 - b The Lymphatics of the Liver.
 - cc A *Plexus* formed by the above mentioned Lacteals and Lymphatics, which surrounds the Cœliac Artery.
 - d A Lymphatic from the Gizzard.
- VOL. LVIII. G g c A

- e A Lymphatic from the lower part of the *Oesophagus*.
- ff A Network formed by the Lymphatics upon the *Aorta*.
- gg The two Thoracic Ducts.
- ii The Trunks of the Lymphatics of the Neck.
- kk The Glands through which the Lymphatic Vessels of the Neck pass. That of the left side is oblong, and could not well be represented in a Figure.
- l The Thoracic Duct of the Left Side, and the Lymphatic Vessel of the Neck, opening together into the inside of the Jugular Vein.
- m A part of the Lymphatic vessel of the right side of the neck, opening into the Jugular Vein.
- n The Thoracic Duct of the right side, joined by a part of the Lymphatic Vessel of the neck, and then opening into the inside of the Jugular Vein.